ELECTRIC DETERRENT DEVICE

Background of the Invention

[01] This invention relates generally to a device in which an electrical shock is delivered to the animal that comes into contact with it. Such devices find primary utility as pest deterrent devices. In particular, this invention pertains to such a device that is particularly well adapted for use as a bird deterrent device, but could be utilized with other animals as well.

[02] Ever since electricity was first put to commercial and residential use in the United States in the late 1800's to solve the age-old problem of darkness, the ability of electrical current to deliver an electric shock to a person or animal has been recognized, and electricity utilized as a result for things other than powering lights and motors. Non-lethal applications of electricity for use in encouraging animals to do something or not do something soon followed the use of electricity for lights and motors. The electric cattle prod is perhaps the best known of those devices. Today, however, electricity is used in many ways with animals, such as electric fences to keep farm animals in and predators out, and even dog trainers sometime use an electrical stimulus in a dog collar to assist in their training.

[03] Another age-old problem that has been perplexing mankind since long before the discovery and harnessing of electricity is the propensity of pests in general, but particularly birds, to land in areas where their human neighbors would prefer they didn't. Since the very first bird deterrent device used by man -- undoubtedly a thrown rock -- an incredible array of devices have been used to dissuade birds from landing or roosting in areas desired by the birds but undesirable to humans. Metallic spike-like, coil or rotating devices, sound-emitting devices, imitation predators, and even real predators, are just a few examples of bird deterrent devices that have been used. Therefore, it is not at all surprising that devices using lethal and non-lethal electrical shock would also be employed along the way.

[04] A typical device of this type is shown in United States Patent No. 4,299,048, in one embodiment of which a pair of copper wires connected to a power source are embedded in opposites sides of a cable of appropriate diameter such that when the birds of choice (in this case, starlings) land on the cable, their feet touch both wires, closing the circuit and thereby delivering a lethal shock to the birds.

[05] The much more recently-issued United States patent No. 6,283,064 discloses another version of a bird and pest deterrent device in which a pair of crimped copper wires are appropriately spaced apart so that the bird's or other pest's feet will touch both wires, resulting in a short circuit and delivering a shock to the bird or other pest.

[06] Other devices for carrying electric charges for discouraging birds and other pests are described in U.S. Patent Nos. 3,294, 893; 3,336,854; 3,717,802; 4,299,048; and 5,850,808, for example. Each of these necessarily include the broad concept of appropriately spaced-apart wires which will both be contacted by the bird (or other pest's) feet (or other part of their anatomy) so as to deliver the appropriate electric shock.

[07] While all of these devices work, at least initially, to an acceptable degree in some installations, the problem that prior art devices of this type have long encountered has been in providing such a device that can be used in something other than relatively straight-line, flat applications and that have a sufficiently long expected useful life in that application. These problems arise from the fact that these devices inherently need two things -- 1) the conductive elements, typically metal wires, that carry the electrical current; and 2) a non-conductive base element, to which the wires are attached. Most typically, the metal wires are held by friction and/or glue within an appropriately sized channel in the base. See, for example, the devices disclosed in U.S. Patent Nos. 5,850,808; 4,299,048 and 3,366,854. Because the metal wires and the non-metallic bases have different coefficients of expansion and contraction, and different degrees of flexibility, however, there is a tendency for the wires in these devices to become detached from the base over time since these devices are typically used in locations that are directly exposed to the weather. This problem is exacerbated if the location to which the device is applied is other than a straight, flat surface, as any twisting or bending of the device places unequal stresses on the base and the wires causing them to become loose or even pop out of their holding channels.

[08] These two problems have been addressed in different ways, and continue to cause problems in the industry, as those skilled in the art continue to seek to find ways to solve the problems. For one recent example, in U.S. Patent No. 6,283,064, the base "has spaced notches along each edge to provide flexibility to the base, whereby the base may be bent both out of the

plane and within the plane" (*id.*, Col. 1, lines 64-66) and the "wires are crimped in undulating fashion along their length, to provide them with give so that they will not disassociate from the base when it is bent or when the wires and base expand and contract at different rates." (*Id.*, Col. 2, lines 7-11).

[09] While the prior art devices are useful to a degree, they still suffer from certain drawbacks, including limitations on the degree to which they can be bent without inducing potentially disabling stresses, and relatively higher cost. Therefore, there exists a need in the art for an improved electrical shock deterrent device that solves these problems, and does so in an efficient, reliable, low cost way.

Summary of the Invention

[010] This invention provides such an improved device by replacing the typically-used wire with a braided element than can be sewn to the base, entirely eliminating the need for an appropriately-sized channel into which the metallic wire is inserted. The braided element can be composed of individual strands of any sufficiently conductive material, such as metal wire. The strands could also include some conductive and some non-conductive strands. The individual strands can be of any appropriate cross-sectional design, such as round, square, oblong or flat. The base can be of any non-conductive material, and is preferably PVC or other elastomeric material that is, in addition to being an insulator, UV resistant and extremely flexible. The size and spacing of the braided element and the size and configuration of the base can be designed for whatever animal, pest or bird is to be deterred.

[011] Because the braided element is not a single, solid piece of metal, but comprised of individual strands woven together to form the braided element, such that each strand can move relative to one another, the braided element can be easily sewn directly onto the base, creating a very strong mechanical bond. If an embodiment is used in which the braided element is substantially flat, it can also be glued to the base, although sewing has proven sufficient and preferable. Other attachment means could also be employed.

[012] Because the preferred base is constructed of a very flexible material, because of the very secure mechanical attachment between the braided elements and the base accomplished by sewing, and because the braided element is extremely flexible, the base and braided element

combination of this invention can literally be bent into a 180-degree angle, inwardly or outwardly, within a curvature radius of less than one inch without experiencing any detachment. In the area of curvature, the braided element simply expands or contracts in width (depending on which way the device is bent) as the added stresses are distributed over all of the individual strands in the braided element, rather than having to be handled by one, single, large wire. Also, because the individual strands are braided, there is significant leeway for them to flex so as to accommodate the severe bending action.

Description of the Figures

[013] Figure 1 is a perspective view of the preferred embodiment of this invention.

[014] Figure 2 is an end view of the preferred embodiment of this invention, showing the braided element in the preferred position on the elevated pedestal portion of the base.

[015] Figure 3 is a side view of the preferred base of this invention, showing that it is preferably constructed off a single extruded piece of material in the desired length.

[016] Figure 4 is a top view of the preferred embodiment of this invention. The dotted line extending down the middle of each of the braided element represents the stitching of the sewn attachment means. The spaced-apart holes in the center of the base that can be used for attaching the base to the desired surface area are also shown.

[017] Figure 5 is an isolated, enlarged view taken from circle-5 in Fig. 4. It shows in greater detail the braided nature of the conductive element and the preferred sewing attachment means. As also depicted here, in the preferred embodiment, the individual strands of the braided element are not braided tightly together at rest, but have some free space. Although the individual strands of the braided element shown here and in the other Figures are depicted as being in a fairly linear cross-hatched arrangement, in one of the preferred embodiments the strands are in a much more curvilinear configuration forming the braided element.

[018] Figure 6 shows the preferred embodiment (absent the sewn stitching) in which the top side of the device is being bent in a concave fashion. Although this Figures shows a very significant curvature, the device of this invention is actually capable of being bent much more

severely without adversely affecting the attachment between the conductive braided elements and the non-conductive base.

[019] Figure 7 is an isolated, enlarged view taken from circle-7 in Fig. 6, and shows that in concave flex, the elongation stress placed on the braided element is absorbed by the individual strands within the braided element pulling tightly together.

[020] Figure 8 shows the preferred embodiment (absent the sewn stitching) in which the top side of the device is being bent in a convex fashion. Although this Figures shows a very significant curvature, the device of this invention is actually capable of being bent much more severely without adversely affecting the attachment between the conductive braided elements and the non-conductive base.

[021] Figure 9 is an isolated, enlarge view taken from circle-7 in Fig. 9, and shows that in convex flex, the compression stress placed on the braided elements is absorbed by the individual strands expanding apart from one another, and the overall width of the braided element becoming larger.

[022] Figure 10 is an end view of one embodiment of the braided element.

Description of the Preferred Embodiments

[023] Looking at Fig. 1, it is seen that the preferred embodiment of this invention is of essentially three-piece construction, having a base **10** and a pair of braided elements **12a** and **12b** attached thereto.

[024] The base **10** has a flat lower surface **20** that is presented for attachment to the surface of the location from which the pests or birds are to be deterred. In this embodiment, as best seen in Fig. 2, the cross-sectional shape of the base **10** is essentially co-joined pedestals **22a** and **22b** that each present an elevated section **24a** and **24b**, respectively, and each having and upper flat surface **26a** and **26b** to which the braided elements **12a** and **12b** are attached. A central gap **28** exists between the two elevated section **24a** and **24b**, and is useful to provide for water run-off to prevent accidental short circuiting of the device in the presence of water which may accumulate due to rain or irrigation.

[025] In this embodiment, the base **10** is approximately 1.5 inches wide, and approximately 0.25 inches high (from the lower surface **20** to the upper surfaces **26a** and **26b**. The height of the elevated sections **24a** and **24b** is approximately 0.06 inches. The width of each of the upper surfaces **26a** and **26b** is approximately 0.25 inches, and the distance between the longitudinal centerlines of the upper surfaces **26a** and **26b** is approximately 0.625 inches, leaving a gap area **28** between them of approximately 0.375 inches. These dimensions are, of course, by way of illustration only. The dimensions can be varied in any fashion as appropriate to the application. Also, the length of the device segment shown is relatively short. The base **10** can be constructed of any length, and is preferably constructed in as long a length as feasible so as to avoid inter-connecting segments of the device. Because the device of this invention can be curved without harming its performance or life-expectancy, it can be rolled for shipment and storage, thus allowing for much longer single-formed pieces than with other prior art devices.

[026] As best seen in Figs. 1 and 4, holes **30** are placed through the base **10** in the gap area **28** at regular intervals along the entire length of the base to facilitate attachment of the device to the perch location (not shown), for example. Plainly, the holes **30** are only one of innumerable ways in which the attachment can be facilitated. Attachment can be my mechanical means such as screw, bolts, staples or nails, or any other attachment means such as adhesives, or a combination of them.

[027] The base **10** can of course be of any shape and size as dictated by the specific size and type of animal, bird or pest to be deterred, and the area to which the device is to be installed, so long as the two braided elements are kept a sufficient distance apart so as to prevent short circuiting, and are not so far apart at to not be short-circuited when the intended-to-be-deterred animal, pest or bird contacts the device.

[028] The base **10** can also be constructed of any material so long as there is sufficient non-conductive material immediately adjacent the braided elements **12a** and **12b** so as to prevent short circuiting. In the preferred embodiment, the entire base **10** is of a single material, in this case extruded polyvinyl chloride ("PVC"), that is extremely flexible, durable and UV resistant, and is sufficiently soft so as to allow for the sewing operation whereby the braided elements **12a** and **12b** can be sewn directly to the base. The base **10** can also be constructed of any color so as

to blend with the structure to which it will ultimately be attached. As noted, it is not necessary that the base be of unitary material and construction. The PVC used in the base can be either cellular, flex or rigid. Other possible material for construction of the base include but are not limited to neoprene, fluoroelastomer (available commercially under trademarks Vitron® and Flourel®), silicone, natural rubber, buna N (nitrile), buna S (SBR), thermoplastic rubber, synthetic polyisoprene, EPDM and polyurethane.

[029] The braided elements **12a** and **12b** comprise individual strands **32** which can be of any suitable conductive material. In some embodiments, the individual strands **32** could include some conductive strands and some not (for example, if a few strands of a very strong, albeit non-conductive material might be desired to add even more strength and durability). While flat braids are preferred, non-flat braided material could also be used. Also, while stainless steel is preferred, copper or zinc plated copper are just two examples of many other conductive materials that could be substituted. A suitable commercially available braid is that provided by Hamilton Products, Sherburne NY (www.hamprods.com). The size of the braid, the number of strands, the size of the individual strands and other specifications for the braided elements are matters of choice depending on the application for the device. However, a 3/8 inch wide braid having 48 strands, and capable of handling up to 40 nominal amperes of current has proven effective for a wide range of applications. Also, although the preferred braided elements **12a** and **12b** have a substantially flat cross-section configuration, braided elements having a substantially oblong, round, rectilinear or even triangular (or any other shape) cross-sectional configuration could also be used.

[030] The preferred means for attaching the braided elements **12a** and **12b** to the base **10** is by sewing. Because the braided elements **12a** and **12b** are composed of multiple strands **32** somewhat loosely woven together rather than the single copper wire used in most prior art devices, there is sufficient free space **34** between the adjacent strands **32** such that the sewing operation never has to pierce, and preferably does not pierce, any of the strands **34**. Rather, the sewing operation creates a secure mechanical lock as the thread used to sew bridges across the individual strands. While any suitably durable and strong thread can be used in the sewing operation, 100% polyester Star Ultra® Monocord from Coats, North American (www.coatscna.com) has proven suitable. A single line of stitching **36** down the longitudinal

center of each braided element **12a** and **12b** has proven sufficient, although many other sewing stitches, styles and placement would work as well.

[031] Of course, other attachment means for attaching the braided elements **12a** and **12b** to the base **10** could be used instead of or in addition to sewing. For example, the braided elements **12a** and **12b** could also be glued or heat-melted to the base, or stapled, or bolted, or screwed into place on the base. However, it is believed that for ease of construction, for durability, and for attractiveness, sewing is preferred.

[032] The ends of braided elements **12a** and **12b** are attached to the terminals of a conventional power source (not shown). A charge of approximately 800 volts alternating current, at low ampere (10 mA) or 7.5 KV, 3 amp direct current, has proven effective to deter birds. Larger voltages and amperes may be necessary for larger animals. Of course, if the desire was to execute the pest rather than simply deter, then the voltages and amperes would have to be increased accordingly, and the current bearing characteristics of the braided elements **12a** and **12b** would have to be adjusted accordingly as well.

[033] The device of this invention can be attached to a just about any surface where deterrence is desired -- from flat horizontal surfaces (such as window ledges, building edges and billboard tops where some birds like to perch and roost), to vertical or skewed surfaces (such as fence rails, posts or other surfaces where the device might be used to deter farm animals, vermin or varmints), to radically curved surfaces (such as on outdoor artwork and statues to deter birds from perching and defacing the structure with their droppings). The device can also easily accommodate planar and non-planar angles. Because the device can be radically bent in a non-planar way, most non-planar surface transitions can be accommodated simply by bending the device. For planar surface transitions, the base **10** and braided elements **12a** and **12b** can be easily cut through at any angle using conventional means so that adjacent ends of the cut pieces can be brought together to follow the application topography. The adjacent cut ends of the braided elements **12a** and **12b** can be reattached to recreate the circuit by any conventional means such as flexible, crimpable connector pieces or soldering, as only two of many examples.

[034] Although preferred embodiments have been shown and described, the disclosed invention and the protection afforded by this patent are not limited thereto, but are of the full scope of the following claims, and equivalents thereto.